

**WHAT IS CLAIMED IS:**

1. A method of generating a graphical representation of data, comprising:  
generating an abstract data structure defining a plurality of abstract attributes representing an abstract graphical representation of the data; and  
generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation of the data in a graphics rendering language.
2. The method of claim 1, further comprising:  
providing a plurality of abstract data structure templates, each abstract data structure template being associated with a specific graphical representation type;  
determining a requested graphical representation type;  
selecting an abstract data structure template from the plurality of abstract data structure templates on the basis of the requested graphical representation type; and  
generating the abstract data structure using the selected abstract data structure template.
3. The method of claim 2, wherein the requested graphical representation type is one of a bar chart, a line chart, a pie chart, a scatter plot and a combination thereof.
4. The method of claim 2, wherein the plurality of abstract data structure templates is associated with a particular data source of the data.
5. The method of claim 1, further comprising:  
providing transformation rules for transforming the abstract data structure into the concrete data structure, the transformation rules describing graphical attributes of a requested graphical representation type; and  
generating the concrete data structure using the transformation rules.

6. The method of claim 5, wherein generating the concrete data structure using the transformation rules comprises:

selecting a subset of the transformation rules in accordance with the requested graphical representation type; and

generating the concrete data structure using the subset of the transformation rules.

7. The method of claim 6, wherein the requested graphical representation type is one of a bar chart, a line chart, a pie chart, a scatter plot and a combination thereof.

8. The method of claim 1, wherein at least one of the abstract data structure and the concrete data structure is defined in Extensible Markup Language (XML).

9. The method of claim 1, wherein the concrete data structure is defined in a vector-based graphics language.

10. The method of claim 9, wherein the vector-based graphics language is one of Vector Markup Language (VML), Scalable Vector Graphics (SVG), and Hypertext Markup Language (HTML) Image Maps.

11. A method of generating a graphical representation of data, comprising:

receiving a selection of a requested graphical representation type for a selected data set;

selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the selected graphical representation type;

generating, on the basis of the requested graphical representation type and the selected abstract data structure template, an abstract data structure defining a plurality of abstract attributes abstractly representing the data set in the graphical representation;

providing transformation rules for transforming the abstract data structure into a concrete data structure, the transformation rules describing graphical attributes of the requested graphical representation type; and

generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation in a graphics rendering language using the transformation rules.

12. The method of claim 11, further comprising:

rendering the data set, as described in the graphics rendering language, in a graphic.

13. The method of claim 11, wherein the graphical representation type is one of a bar chart, a line chart, a pie chart, a scatter plot and a combination thereof.

14. The method of claim 11, wherein the plurality of abstract data structure templates is associated with a particular data source of the data.

15. The method of claim 11, further comprising:

selecting a subset of the transformation rules in accordance with the graphical representation type; and

generating the concrete data structure using the subset of the transformation rules.

16. The method of claim 11, wherein at least one of the abstract data structure and the concrete data structure is defined in Extensible Markup Language (XML).

17. The method of claim 11, wherein the concrete data structure is defined in a vector-based graphics language.
18. The method of claim 17, wherein the vector-based graphics language is one of Vector Markup Language (VML), Scalable Vector Graphics (SVG), and Hypertext Markup Language (HTML) Image Maps.
19. A method of generating an abstract data structure for a graphical representation of data, comprising:
  - providing a plurality of abstract data structure templates, each abstract data structure template being associated with a specific graphical representation type;
  - determining a requested graphical representation type;
  - selecting an abstract data structure template from the plurality of abstract data structure templates on the basis of the requested graphical representation type; and
  - generating an abstract data structure using the selected abstract data structure template.
20. A method of generating a graphical representation of data, comprising:
  - receiving a selection of a graphical representation type for a selected data set;
  - selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the selected graphical representation type;
  - generating, on the basis of the selected abstract data structure template, an abstract data structure defining a logical representation of the data set graphically represented according to the selected graphical representation type; and
  - transforming the abstract data structure into a graphics rendering language.

21. A method of generating a graphical representation of data, comprising:
  - receiving abstract attributes values comprising at least a selection of a requested graphical representation type for a selected data set;
  - selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the selected graphical representation type;
  - generating, on the basis of the received abstract attributes values and the selected abstract data structure template, an abstract data structure defining a plurality of abstract attributes abstractly representing the data set in the graphical representation;
  - selecting transformation rules for transforming the abstract data structure into a concrete data structure from a plurality of transformation rules, the transformation rules describing graphical attributes of the requested graphical representation type; and
  - generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation in a graphics rendering language using the transformation rules.
22. A computer-readable medium containing a program which, when executed by a processor, performs a process of generating a graphical representation of data, the process comprising:
  - generating an abstract data structure defining a plurality of abstract attributes representing an abstract graphical representation of the data; and
  - generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation of the data in a graphics rendering language.

23. The computer-readable medium of claim 22, wherein the process further comprises:

retrieving a plurality of abstract data structure templates, each abstract data structure template being associated with a specific graphical representation type;

determining a requested graphical representation type;

selecting an abstract data structure template from the plurality of abstract data structure templates on the basis of the requested graphical representation type; and

generating the abstract data structure using the selected abstract data structure template.

24. The computer-readable medium of claim 23, wherein the requested graphical representation type is one of a bar chart, a line chart, a pie chart, a scatter plot and a combination thereof.

25. The computer-readable medium of claim 23, wherein the plurality of abstract data structure templates is associated with a particular data source of the data.

26. The computer-readable medium of claim 22, wherein the process further comprises:

retrieving transformation rules for transforming the abstract data structure into the concrete data structure, the transformation rules describing graphical attributes of a requested graphical representation type; and

generating the concrete data structure using the transformation rules.

27. The computer-readable medium of claim 26, wherein generating the concrete data structure using the transformation rules comprises:

selecting a subset of the transformation rules in accordance with the requested graphical representation type; and

generating the concrete data structure using the subset of the transformation rules.

28. The computer-readable medium of claim 27, wherein the requested graphical representation type is one of a bar chart, a line chart, a pie chart, a scatter plot and a combination thereof.
29. The computer-readable medium of claim 22, wherein at least one of the abstract data structure and the concrete data structure is defined in Extensible Markup Language (XML).
30. The computer-readable medium of claim 22, wherein the concrete data structure is defined in a vector-based graphics language.
31. The computer-readable medium of claim 30, wherein the vector-based graphics language is one of Vector Markup Language (VML), Scalable Vector Graphics (SVG), and Hypertext Markup Language (HTML) Image Maps.
32. A computer-readable medium containing a program which, when executed by a processor, performs a process of generating a graphical representation of data, the process comprising:
  - receiving a selection of a requested graphical representation type for a selected data set;
  - selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the requested graphical representation type;
  - generating, on the basis of the requested graphical representation type and the selected abstract data structure template, an abstract data structure defining a plurality

of abstract attributes abstractly representing the data set in the graphical representation;

retrieving transformation rules for transforming the abstract data structure into a concrete data structure, the transformation rules describing graphical attributes of the requested graphical representation type; and

generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation in a graphics rendering language using the transformation rules.

33. The computer-readable medium of claim 32, wherein the process further comprises:

rendering the data set, as described in the graphics rendering language, in a graphic.

34. The computer-readable medium of claim 32, wherein the graphical representation type is one of a bar chart, a line chart, a pie chart, a scatter plot and a combination thereof.

35. The computer-readable medium of claim 32, wherein the plurality of abstract data structure templates is associated with a particular data source of the data.

36. The computer-readable medium of claim 32, wherein the process further comprises:

selecting a subset of the transformation rules in accordance with the graphical representation type; and

generating the concrete data structure using the subset of the transformation rules.

37. The computer-readable medium of claim 32, wherein at least one of the abstract data structure and the concrete data structure is defined in Extensible Markup Language (XML).

38. The computer-readable medium of claim 32, wherein the concrete data structure is defined in a vector-based graphics language.

39. The computer-readable medium of claim 38, wherein the vector-based graphics language is one of Vector Markup Language (VML), Scalable Vector Graphics (SVG), and Hypertext Markup Language (HTML) Image Maps.

40. A computer-readable medium containing a program which, when executed by a processor, performs a process of generating an abstract data structure for a graphical representation of data, the process comprising:

retrieving a plurality of abstract data structure templates, each abstract data structure template being associated with a specific graphical representation type;

determining a requested graphical representation type;

selecting an abstract data structure template from the plurality of abstract data structure templates on the basis of the requested graphical representation type; and

generating an abstract data structure using the selected abstract data structure template.

41. A computer-readable medium containing a program which, when executed by a processor, performs a process of generating a graphical representation of data, the process comprising:

receiving a selection of a graphical representation type for a selected data set;

selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type,

wherein the selected abstract data structure template is specific to the selected graphical representation type;

generating, on the basis of the selected abstract data structure template, an abstract data structure defining a logical representation of the data set graphically represented according to the selected graphical representation type; and

transforming the abstract data structure into a graphics rendering language.

42. A computer-readable medium containing a program which, when executed by a processor, performs a process of generating a graphical representation of data, the process comprising:

receiving abstract attributes values comprising at least a selection of a requested graphical representation type for a selected data set;

selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the selected graphical representation type;

generating, on the basis of the received abstract attributes values and the selected abstract data structure template, an abstract data structure defining a plurality of abstract attributes abstractly representing the data set in the graphical representation;

selecting transformation rules for transforming the abstract data structure into a concrete data structure from a plurality of transformation rules, the transformation rules describing graphical attributes of the requested graphical representation type; and

generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation in a graphics rendering language using the transformation rules.

43. A computer, comprising:

a database having data; and  
at least one graphics language framework residing in memory for generating graphics rendering language for the data, the at least one graphics language framework being configured for:

generating an abstract data structure defining a plurality of abstract attributes representing an abstract graphical representation of the data; and  
generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation of the data in a graphics rendering language.

44. A computer, comprising:

a database having data; and  
at least one abstract data structure interface residing in memory for generating an abstract data structure for a graphical representation of the data, the at least one abstract data structure interface being configured for:

retrieving a plurality of abstract data structure templates, each abstract data structure template being associated with a specific graphical representation type;

determining a requested graphical representation type;  
selecting an abstract data structure template from the plurality of abstract data structure templates on the basis of the requested graphical representation type; and

generating an abstract data structure using the selected abstract data structure template.

45. A computer, comprising:

a database having data; and  
at least one graphics language framework residing in memory for generating graphics rendering language for the data, the at least one graphics language framework being configured for:

receiving a selection of a graphical representation type for a selected data set;

selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the selected graphical representation type;

generating, on the basis of the selected abstract data structure template, an abstract data structure defining a logical representation of the data set graphically represented according to the selected graphical representation type; and

transforming the abstract data structure into the graphics rendering language.

46. A computer, comprising:

a database having data; and

at least one graphics language framework residing in memory for generating graphics rendering language for the data, the at least one graphics language framework being configured for:

receiving a selection of a requested graphical representation type for a selected data set;

selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the requested graphical representation type;

generating, on the basis of the requested graphical representation type and the selected abstract data structure template, an abstract data structure

- defining a plurality of abstract attributes abstractly representing the data set in a graphical representation;
- retrieving transformation rules for transforming the abstract data structure into a concrete data structure, the transformation rules describing graphical attributes of the requested graphical representation type; and
- generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphics rendering language using the transformation rules.

47. A computer, comprising:

- a database having data; and
- at least one graphics language framework residing in memory for generating graphics rendering language for the data, the at least one graphics language framework being configured for:
  - receiving abstract attributes values comprising at least a selection of a requested graphical representation type for a selected data set;
  - selecting an abstract data structure template from a plurality of abstract data structure templates, each being specific to a different graphical representation type and defining a plurality of template attributes for generically representing an abstract graphical representation in the respective different graphical representation type, wherein the selected abstract data structure template is specific to the selected graphical representation type;
  - generating, on the basis of the received abstract attributes values and the selected abstract data structure template, an abstract data structure defining a plurality of abstract attributes abstractly representing the data set in the graphical representation;
  - selecting transformation rules for transforming the abstract data structure into a concrete data structure from a plurality of transformation rules, the transformation rules describing graphical attributes of the requested graphical representation type; and

generating, on the basis of the abstract data structure, a concrete data structure defining a concrete graphical representation in a graphics rendering language using the transformation rules.